do 6 ÷ 3 50

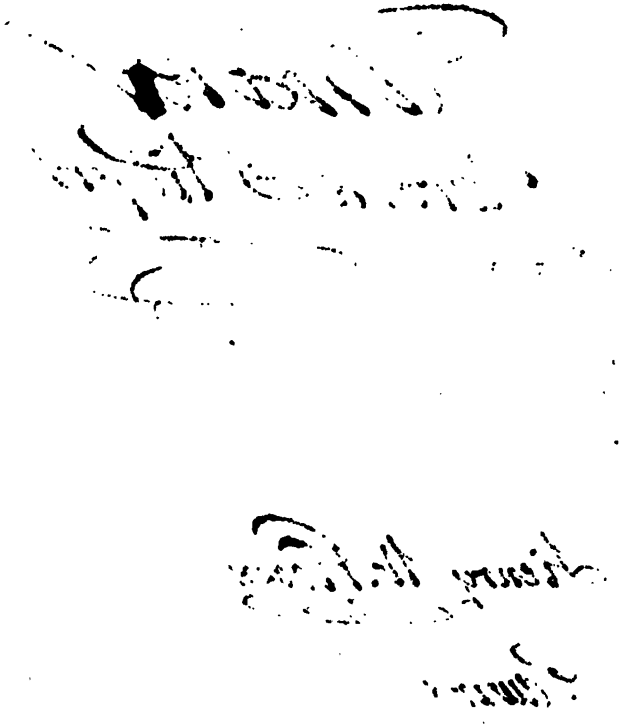
Edward

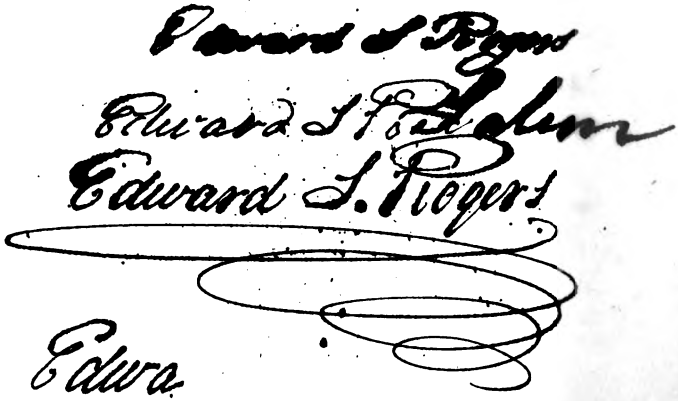
Edward S Rogers

5 X 4
5 +
+

Henry W. Rogers

Edward





Edward S Rogers

THIRD-PART KEY.

A

KEY

TO

THE NORTH AMERICAN ARITHMETIC,

PART THIRD.

BY FREDERICK EMERSON,
AUTHOR OF THE NORTH AMERICAN ARITHMETIC.

Improved Stereotype Edition.

BOSTON:
AMERICAN STATIONERS' COMPANY.
JOHN B. RUSSELL.
1837.

GEORGE ARTHUR

METHOD OF CONDUCTING RECITATIONS.

The following method of examining the written operations of a class of scholars, is given in the Second Part of the Arithmetic. Lest it should escape the eye of the teacher, however, it is here repeated.

A certain number of examples having been assigned for a lesson the day previous, each scholar is supposed to be prepared with the solutions upon his slate, and the class are paraded for recitation. Every scholar passes his slate into the hands of the scholar next on his right, except the scholar standing on the extreme right, who carries his to the scholar on the extreme left. The first scholar then reads from the slate he holds, the answer to the first example; and the teacher, holding the key, declares the answer to be *right*, or *wrong*. When the answer has been pronounced *right*, it is the duty of every scholar who finds a different answer upon the slate he holds, to signify it, and the error is noted against the owner of the slate. The first example being disposed of, the answer to the second example is read by the second scholar, and disposed of in like manner. Thus the reading of answers goes through the class, and each scholar detects the errors of his neighbor. Individual scholars are occasionally called upon to explain their work in a particular example, and to give their reasons for the operation adopted. By this mode of examination, the work of a large class is particularly inspected, in nearly the same time that would be required to inspect the work of one scholar. Besides the advantage of despatch in this mode of examination, the exercise itself is beneficial to the pupils.—Each scholar acts the part of an inspector—he is interested to be critical—he acquires a facility in deciphering the work of others—and thus his perceptive powers are cultivated, and a habit of alertness is attained.

KEY.

ANSWERS TO EXAMPLES.

Article II.

NOTATION AND NUMERATION.

Ex. 1.	478 241 100
2.	7 692 089
3.	19 020 005
4.	800 000 000 000
5.	1 000 644 513
6.	1 534 003 018 004
7.	200 000 016 001
8.	11 001 000 060
9.	5 008 004 009 007
10.	100 020 300 002 004
11.	31 000 000 000 560
12.	6 214 000 000 000 000
13.	249 000 000 000 075 022
14.	46 001 000 019 000 000 708
15.	900 000 000 325 000 000 002 014

III.

ADDITION.

1.	132 164	3.	75 879
2.	140 819	4.	6 144 030 579

IV.

SUBTRACTION.

1.	822	4.	482 668
2.	287 974	5.	99 999 967 501
3.	440 565		

V.

MULTIPLICATION.

1.	4 426 491 540	5.	2 331 200 000
2.	23 183 864 291	6.	936 187 200
3.	2 510 084 850	7.	105 000 000 000
4	249 755 176		

VI.

DIVISION.

1.	$451\,433\,367\frac{8}{9}$	5.	$191\,863\frac{51842}{86000}$
2.	$147\,929\frac{352}{502}$	6.	$806\,574\frac{3924}{10000}$
3	$6\,021\frac{719}{8649}$	7.	$4\,611\frac{23}{63}$
4.	$952\,649\frac{18991}{27856}$	8.	$26\,995\,790\frac{3932}{5274}$

VII.

PROPERTIES OF NUMBERS.

The only answers to be given by the learner in this article, consist in examples of the terms defined, and properties described. Since these examples may be various, none are here introduced—they are left to the criticism of the teacher.

VIII.

PROBLEMS.

1.	28 884	16.	18
2.	15 500	17.	18
3.	3473	18.	17
4.	7 000 000	19.	6
5.	94 038	20.	7
6.	558	21.	11
7.	470 624	22.	8
8	Senate 48; House 240	23.	900
9.	4 629	24.	240
10	2 800	25.	12 600
11.	25 203	26.	2 940
12.	365	27.	1 216 299 276
13.	78 053 034 201	28.	2 016
14.	416 784	29.	720
15.	14		

IX.

COMPOUND NUMBERS.

1. 337 585qr.
2. £25 14s. 1d.
3. 340 157gr.
4. 35T. 17cwt. 1qr. 23lb. 7oz. 13dr.
5. 1 332 005gr.
6. 17E. e. 3qr.
7. 460pt.
8. 19hhd.
9. 361pt.
10. 82M. 4fur 31r.
11. 307 200sq. r.
12. 27yd.
13. 32 197 728sec.
14. £290 4s. 0d. 1qr.
15. 10lb. 10oz. 10dwt. 23gr.
16. 41T. 14cwt. 1qr. 21lb. 6oz.
17. 117yd. 3qr. 2na.
18. 399bu. 3pk. 5qt. 1pt.
19. 41p. 81gal. 1qt.
20. 172A. 0R. 15r.
21. 660T. 41ft. 879in.
22. 1lb. 1oz. 4dwt.
23. 5T. 15cwt 1qr. 13lb.
24. 1℔ 11℥ 1℥ 0ʒ 15gr.
25. 4yd. 2qr. 2na.
26. 41bu. 2pk. 1qt. 1pt.
27. 2hhd. 46gal. 2qt.
28. 6bl. 0kil. 0fir. 2gal. 1qt.
29. 2yd. 1ft. 4in.
30. 582A. 1R. 9r.
31. 1Y. 274d. 19h. 5m.
32. £15 550 4s.
33. 137lb. 0oz. 15dwt. 8gr.
34. 302cwt. 1qr. 2lb.
35. 2 993bu. 0pk. 6qt. 1pt.
36. 290p. 45gal.
37. 188m. 0fur. 5r.
38. 67m. 324A. 2R. 15r.
39. 257Y. 333d.
40. £5 9s. 5d. $2\frac{13}{23}$qr.
41. 1lb. 2oz. 2dwt. $2\frac{3}{13}$gr.

42. 2T. 8cwt. 0qr. 5lb. 9oz. $6\frac{2}{5}$dr.
43. 4E. e. 2qr. $0\frac{7}{31}$na.
44. 32bu. 1pk. 5qt. $1\frac{13}{25}$pt.
45. 14gal.
46. 3d. 15h. 50m. 24s.
47. $94644.55
48. $7336.37
49. $99702.82
50. $7387
51. $41.28
52. $117.36
53. $4\frac{146}{700}$
54. $1002\frac{288}{436}$ barrels.
55. $\$5.736\frac{222}{373}$
56. $97\frac{21}{407}$cts.
57. $58\frac{18}{19}$ times.
58. $199.68
59. $1.89
60. $62.72
61. $108
62. 672 bottles.
63. £13 16s.
64. 2d. 1qr.
65. $32.76
66. 6 cords.
67. £4 16s. 6d.
68. *$1494
69. 64 cubic inches.
70. 8 cubic inches. 27 cu. in. 125 cu. in. and 64 cu. in.
71. 1664 cubic inches.
72. 13760 cubic inches.
73. £588 14s. 6d.
74. 45gal. 0qts. 1pt.
75. 16ml. 2fur. 9r.
76. 15 cords.
77 $1044.16
78. 3lb. 7oz. 6dwt. 16gr.
79. 529yds. 2qr. 2na.
80. 76bl. 0kil. 1fir. 1gal. 1qt.
81. 1 barrel.
82. £519 19s. 8d. $2\frac{10}{11}$ qr.
83. 1 tier. 21gal.
84. 80A. 1R. 30r.
85. 32 rods.
86. 131 feet.
87. 48 feet.
88. 10ft. 8in
89. 10 feet.

*In the first edition of the Arithmetic, for 30 A 2R 2r. read 30 A 2R. 20r.

X.

FRACTIONS.

1. $\frac{1}{3}$

2. $\frac{17}{37}$

3. $\frac{4}{15}$ $\frac{15}{17}$ $\frac{1}{3}$ $\frac{13}{28}$ $\frac{90}{217}$ $\frac{7}{8}$

4. $\frac{144}{9}$

5. $\frac{975}{13}$

6. $\frac{1026}{342}$

7. $\frac{1110}{15}$

8. $\$\frac{51\,76}{8}$

9. $\frac{256}{7}$

10. $\frac{613}{24}$

11. $\frac{143913}{234}$

12. $\$\frac{8665}{16}$

13. $45\frac{1}{4}$

14. $177\frac{8}{9}$

15. 3021

16. $\$137\frac{3}{7}$

17. $\frac{3}{8}$

18. $\frac{5}{33}$

19. $\frac{19}{200}$

20. $\frac{27}{1256}$

21. $\frac{5}{4}$

22. $\frac{11\frac{2}{3}}{14}$

23. $\frac{4\frac{3}{4}}{5}$

24. $\frac{6\frac{4}{11}}{24}$

25. $\frac{3\frac{1}{3}}{4}$

26. $\frac{6\frac{6}{7}s.}{12}$

27. $\frac{3805}{5760} = \frac{761}{1152}$

28. $\frac{77}{320}$

29. $\frac{7}{72}$

30. $\frac{373}{2520}$hhd.

31. $\frac{9092}{35840} = \frac{2273}{8960}$T.

32. 3qt. 1pt. $1\frac{1}{35}$gi.

33. 13s. 4d.

34. 1ft. $9\frac{21}{25}$in.

35. 1qr. 21lb.

36. 3pk. 6qt. $0\frac{4}{7}$pt.

37. $\frac{525}{840}$, $\frac{770}{840}$, $\frac{540}{840}$, $\frac{728}{840}$

38. $\frac{225}{1275}$, $\frac{170}{1275}$, $\frac{204}{1275}$

39. $\frac{153}{408}$, $\frac{240}{408}$, $\frac{204}{408}$, $\frac{340}{408}$

40. $\frac{702}{14586}$, $\frac{3553}{14586}$

41. $\frac{140}{315}$, $\frac{108}{315}$

42. $\frac{63}{23}$

43. $\frac{32}{7}$, $\frac{2}{25}$, $\frac{47}{64}$, $\frac{39}{68}$, $\frac{35}{8}$, $\frac{22}{25}$, $\frac{189}{136}$

44. Performed.

45. $44\frac{47}{280}$
46. $2\frac{671}{840}$
47. $22\frac{553}{720}$
48. $44\frac{3161}{3960}$
49. $10\frac{1}{6}$ pence.
50. 1pt. $1\frac{83}{104}$gl.
51. 5d. 20h. 52m. $15\frac{15}{19}$s.
52. 2qr. 17lb. 1oz. $3\frac{11}{13}$dr.
53. Performed.
54. $\frac{53}{266}$
55. $\frac{13}{374}$
56. $32\frac{49}{60}$
57. $36\frac{39}{160}$
58. $5\frac{239}{240}$
59. $\frac{5}{12}$
60. $\frac{399}{25474}$
61. $4\frac{31}{60}$
62. Performed.
63. $30\frac{5}{8}$
64. $\frac{7}{30}$
65. $22\frac{27}{50}$
66. $8\frac{1}{13}$
67. $2772\frac{3}{10}$
68 $\frac{5}{18}$
69. $104\frac{43}{160}$
70. They are alike.
71. $7373\frac{3}{14}$
72. $12474\frac{5}{9}$
73. $173\frac{13}{24}$ inches.
74. Performed.
75. 30
76. $\frac{15}{16}$
77. $\frac{3}{40}$
78. $56\frac{12}{23}$
79. $\frac{7}{104}$
80. $97\frac{5}{7}$
81. $2\frac{11}{12}$
82. $5\frac{67}{100}$
83. $6\frac{7}{73}$
84. $22\frac{435}{1256}$
85. $1124\frac{2}{21}$ times.
86. $5\frac{5}{693}$ times.
87. $37\frac{1}{35}$ times.
88. $3628\frac{4}{5}$ times.
89. $57\frac{15}{53}$ times.
90. 230m. 2fur. 30r.
91. $28604\frac{28}{103}$ times.
92. 10cwt. 1qr. 20lb. 8oz.
93. 5T. 3cwt. 2qr. 24lb. 11oz. $13\frac{7}{45}$dr.
94. 86A. 0R. 1r. 10yd 0ft. 108in.
95. $\$1734.91\frac{1}{14}$
96. $\$71.68\frac{3}{4}$
97. $\$3.93\frac{3}{4}$
98. 1m. 145A. 1R. 30r. 7yd. 5ft. 9in.

99. 19A. 1R. $6\frac{1}{10}$r.
100. 2C. $4\frac{25}{256}$ft.
101. $25\frac{3}{5}$ rods.
102. $2715\frac{5}{193}$lb.
103. 59yd. 5ft. 1080in.
104. 49.ft. 378in.
105. 69ft. $2\frac{10}{13}$in.
106. $8\frac{136}{279}$ feet.
107. 171gall. 3qt. 0pt. $2\frac{866}{17856}$gl.
108. $304.21\frac{7}{8}$
109. $49.38\frac{8}{9}$
110. 504 bottles.
111. $115\frac{41}{45}$ bottles.
112. $1083
113. $72\frac{11}{12}$ cents.
114. $42\frac{29}{63}$ cents.
115. $51.01\frac{1}{2}$
116. $4.98\frac{3}{32}$
117. $5.04\frac{16}{21}$
118. $185.41\frac{2}{3}$
119. $75.33
120. $5.14\frac{58}{67}$
121. £20 15s. 0d. $3\frac{3}{4}$qr.
122. 2s. 9d. $0\frac{1876}{1971}$qr.
123. 8d. $0\frac{16}{25}$qr.
124. £258 7s. 7d. $1\frac{1}{2}$qr.
125. 1s. 3d. $0\frac{228}{865}$qr.
126. £5 18s. 0d. $3\frac{15}{19}$qr.
127. $5.25
128. $2.75\frac{1}{3}$
129. $15\frac{110}{261}$ cents.
130. $88\frac{512}{1701}$ cents.
131. $76.32\frac{1}{8}$
132. $14.40\frac{3}{4}$
133. $82.22\frac{47}{60}$
134. $963.57\frac{11}{24}$
135. $5833\frac{1}{10}$ pounds.
136. $5166.69\frac{1}{8}$ due to D.
137. $18\frac{779948693}{4059644944}$
138. $\frac{13}{100}$
139. $972\frac{2}{5}$
140. $47\frac{22}{25}$
141. $\frac{7}{40}$
142. $\frac{33}{380}$
143. $\frac{782}{899}$
144. $\frac{487}{900}$ and $\frac{287}{900}$
145. $\frac{31}{36}$
146. $7\frac{7}{12}$
147. $\frac{28}{308}$
148. $7\frac{43}{100}$
149. $\frac{27}{112}$ of the ship.
150. $\frac{19}{240}$ of the ship.
151. $\frac{35}{486}$ of the ship.

XI.

DECIMAL FRACTIONS.

1. Ninety-nine *hundredths.*
Sixty-four *thousandths.*
Three *ten-thousandths.*
Five thousand, two hundred and thirty-seven *ten-thousandths.*
Two thousand and eight *ten-thousandths.*
Six *hundred-thousandths.*
Three thousand, seven hundred and ninety-five *hundred-thousandths.*
One hundred, and thirty thousand, and nine *millionths.*
Four, and eight *thousandths.*
Six, and thirty-seven thousand and two *hundred-thousandths.*
Ninety-nine thousand, nine hundred and ninety-nine *hundred-thousandths.*
Five, and one *ten-thousandth.*
Twenty-four, and nine *hundredths.*
Six hundred and thirty, and one thousand one hundred and seventy-four *ten-thousandths.*
Six, and nine hundred and seventy-two thousand four hundred and seventy-nine *millionths.*
Twenty-eight, and seven hundred and ninety-seven *thousandths.*

2. 18.7; 24.09; 38.006; 65.0008; 2.025; 326.13; 7.021; 19.0342; 33.17; 8.0201; 97.042; 6.1251; 8.0011; 47.00001; 6.0251; 55.0000291

3.	Performed.	6	$380.62
4.	9386.9465	7.	$176.1964
5.	100.59139	8.	Performed.

9.	24.59169
10.	212.24
11.	12689.30725
12.	50.718964
13.	.9
14.	11.367
15.	.0065
16.	$7.589
17.	$14.094
18.	Performed.
19.	115.56
20.	25.1494
21.	14.3681
22.	.00396
23.	.0073111
24.	5749.6789656
25.	$417.496
26.	$210.42
27.	$149.8893
28.	$2.475
29.	$1365.392
30.	$124673.17875
31.	$91.92
32.	$14.3034
33.	$6.55875
34.	.00182002625
35.	36298.1
36.	Performed.
37.	Performed.
38.	Performed.
39.	Performed.
40.	135.070127
41.	.036912
42.	705.936961
43.	1196.172248
44.	198.377168
45.	1148.997696
46.	2325.203252
47.	20.163
48.	.000201
49.	56.25
50.	$5.781764
51.	$36.715
52.	1.5 barrel
53.	$5.384
54.	88.38095238
55.	.033834
56.	.125
57.	.639175
58.	.5
	.75
	.833333
	.1875
	.153846
	.230769
	.933333
	.555555
	.011686

59.	Performed.	81.	£19.6895833
60.	.5	82.	17.156746hhd.
	.75	83.	15.0128906 tons.
	.2	84.	4.9049242 miles.
	.875	85.	25.6567442 rods.
	.6875	86.	Performed.
	.7916	87.	$391.121 25
	.06	88.	$73.353
	.008	89.	$40.19225
61	.14	90.	$53.0357136
62	.075	91.	$621.751745086
63.	247.3125	92.	$0.7265625
64.	Performed.	93.	$18.3425
65.	Performed.	94.	$499.06875
66.	$\frac{3}{8}$	95.	$2439.45875
67.	$\frac{38241}{50000}$	96.	$110.2734375
68.	$\frac{102101}{200000}$	97.	$4.275
69.	$\frac{542029}{5000000}$	98.	$2.1352499
70.	$\frac{36001}{781250}$	99.	$15.247351
71.	£.628125	100.	Performed.
72.	.625 cwt.	101.	15s. 6d.
73.	.3375 acre.	102.	7d. 2qr.
74.	.0569444 pound.	103.	5oz. 12dwt.
75.	.265625 bushel.		15.744gr
76.	.125 ton.	104.	2qr. 13lb. 14oz.
77.	.0023674 mile.		3.328dr.
78.	.00103305 acre.	105	20r. 4yd. 2ft.
79.	.109375 cord.		9.408in.
80.	.0024917 year.	106.	1 rood 22r.

107. 21lb. 15oz. 3.712dr.

108. 13.1229gall.

109. 1qr. 24lb. 4oz. 13.824dr.

110. £741 13s. 8d. 3.52qr.

111. 84M. 5fur. 25r. 1yd. 1ft. 7.44in.

112. 50A. 2R. 38r. 21yd. 7ft. 2.88in.

113. $0.166+
$0.333+
$0.50
$0.666+
$0.833+

114. $0.125
$0.25
$0.375
$0.50
$0.625
$0.75
$0.875

115. $0.133+
$0.266+
$0.40
$0.533+
$0.666+
$0.80

116. $0.214+
$0.428+
$0.642+
$0.857+

117. $0.20
$0.40
$0.60
$0.80
$1

118. $2.25

119. $143.229+

120. $1.687+

121. $64.716+

122. $2.522+

123. $38.338+

124. $3.607+

125. $234.20+

126. $3.483+

127. $85.862+

128. $1.50
$1.125
$1.20
$1.928+
$1.80

129. 29.017037 tons.

130. 1.85149hhd.

131. $91.074

132. $3.456

133. $217.062+

134. $4.995+
135. $127.36571216
136. $614.678+
137. $21.823+
138. $1.715
139. $9.05625
140. $6.513+
141. $0.055+
142. $11.718+
143. $13.27
144. $96.875
145. 4.899133 miles.
146. 142.7825
147. 142.7825
148. .4275
149. 1.539
150. 35.7
151. 1119.552
152. 2.871481
153. 52.33275
154. $2234.46
155. $2234.46
156. $5519.68
157. $21.52
158. $78.678
159. $62.50
160. $13145.10
161. 54.014598 gallons.
162. 54.545454lb.
163. 30.826369 hours.
164. 21.12 acres
165. 8.666666 bushels
166. 38.823529 bushels
167. 43.636363 gallons
168. $12.943+
169. $231.65
170. 265.4775 sq. ft.
171. 15.0485995 sq. ft
172. 39.1874917 c. ft.
173. 10.382666 ft.
174. 615.125 sq. ft.
175. $130.40
176. $365.365
177. $1.50
178. $930.699
179. $1724.6173
180. A receives
$40.9475
B receives
$14.3925
C relinquishes
$32.4825
D relinquishes
$22.8575
181. 134.8 rods.
182. 56min. 42sec.
183. .1964

184. $1.505
185. 79.92
186. 3.0515 acres.
187. 7427.03
188. $4.6675
189. 145.4995 greater;
144.5095 smaller.
190. Chaise cost
$252.165
Horse cost
$185.085
191. 572.486
192. 15.1428ft.
193. 5.235988
194. 1260 soldiers.
195. .001125
196. 16.068lbs.
197. 5.148
198. 6.458ft.
199. 3.346ft.
200. 17.048ft.
201. 20.408ft.

XII.

INFINITE DECIMALS.

1. $\frac{2}{3}$
2. $\frac{1}{27}$
3. $\frac{41}{333}$
4. $\frac{1}{7}$
5. $\frac{28490}{37037}$
6. $21\frac{124}{333}$
7. $\frac{2}{15}$
8. $\frac{67}{150}$
9. $\frac{527}{990}$
10. $\frac{405830}{499500}$
11. $\frac{83}{900}$
12. $\frac{566447}{6666600}$
13. Performed.
14. $9.81\dot{4}81\dot{4}8\dot{1}$
$1.50\dot{0}0000\dot{0}$.
$87.2666666\dot{6}$
$.0833333\dot{3}$
$124.090909\dot{0}$
15. $.32\dot{1}32\dot{1}3\dot{2}$
$.82\dot{6}2626\dot{2}$
$.05\dot{0}5050\dot{5}$
$.090\dot{2}9029\dot{0}$
$.666666\dot{6}\dot{6}$

16 $531\dot{5}31\dot{5}3\dot{1}$
$734\dot{8}48\dot{4}84\dot{4}$
$070\dot{7}07\dot{0}7\dot{0}$
$053\dot{0}53\dot{0}5\dot{3}$
$749\dot{0}00000\dot{0}$

17 Performed.

18 Infinite. The repetend consists of 6 figures; beginning at the first place.

19. Infinite. The repetend consists of 6 figures; beginning at the first place.

20. Infinite. The repetend consists of 4 figures; beginning at the third place.

21. Infinite. The repetend consists of 44 figures; beginning at the sixth place.

22. The decimal is finite.

23. Performed.

24. $5977.10\dot{3}6\dot{7}$

25. $222.58\dot{2}39056\dot{}$

26. $339.62\dot{6}51\dot{0}7\dot{7}$

27. Performed

28. $391.5526\dot{}$

29. $3.81\dot{8}\dot{2}$

30. $1407.69\dot{2}72404717949\dot{}$

31. Performed.

32. $7.26\dot{2}$

33. $750730.5\dot{1}8\dot{}$

34. $31.7\dot{9}\dot{1}$

35. $34998.41\dot{9}900\dot{3}$

36. $13.5\dot{1}6953\dot{3}$

37. $27\dot{5}$

38. $.\dot{2}49158\dot{}$

39. Performed.

40. $301.\dot{7}14285\dot{}$

41. $3.14\dot{5}$

42. .041763253253397282174260591526778577138289368505195843

XIII.

RELATIONS OF NUMBERS.

1	$\frac{2}{7}$	26.	$\frac{28}{45}$
2	$\frac{1}{5}$	27.	$\frac{47}{50}$
3	$\frac{10}{17}$ $\frac{21}{34}$	28	$\frac{187}{225}$
4.	$\frac{49}{34}$	29.	$\frac{87}{224}$
5.	$\frac{3}{2}$; $\frac{37}{24}$	30.	$\frac{283}{4192}$
6.	$\frac{7}{9}$	31.	$\frac{67}{1920}$
7.	$\frac{5}{6}$	32.	$\frac{1256}{2079}$
8.	$\frac{101}{444}$	33.	$\frac{3}{1}$
9.	$\frac{19}{66}$	34.	$\frac{1}{2}$
0.	$\frac{9}{56}$	35.	$\frac{56}{27}$
11.	$\frac{39}{40}$	36.	$\frac{108}{65}$
12.	Performed.	37.	$\frac{279}{88}$
13.	$\frac{86}{105}$	38.	$\frac{67}{36}$
14	$\frac{200}{487}$	39.	$\frac{3695}{1224}$
15	$\frac{375}{602}$	40.	$\frac{13579}{8442}$
16	$\frac{204}{325}$	41.	$\frac{7173}{4352}$
17	Performed.	42.	Performed.
18.	$\frac{749}{200}$	43.	299 miles.
19.	$\frac{3}{2}$	44.	2min. 30sec.
20.	$\frac{32}{5}$	45.	$\$70.35\frac{5}{7}$
21.	$\frac{1571}{290}$	46.	$\$129016.84
22.	$\frac{970}{253}$	47.	$118\frac{47}{57}$ barrels.
23.	$\frac{1}{2}$	48.	$1\frac{1}{3}$ hours.
24.	$\frac{97}{108}$	49.	$\$99.555\frac{5}{9}$
25.	$\frac{2}{11}$	50.	$4523\frac{1}{13}$ yards.

51. 75 bushels.
52. $293\frac{1}{3}$ feet.
53. $26\frac{23}{32}$ yards.
54. $\$229.894\frac{14}{19}$
55. £209 10s. $2\frac{3}{11}$d.
56. 11A. 2R. $17\frac{23}{36}$r.
57. $\$896.666\frac{2}{3}$
58. $\$69.758\frac{4}{7}$
59. $\$57.24\frac{9}{109}$
60. $32\frac{508}{3447}$ barrels.
61. $54\frac{52}{53}$ bottles
62. 77 gross.
63. £1030 7s. 4d. 2qr.
64. $7\frac{259}{263}$ yards.
65. $60\frac{21}{376}$ days.
66. $\$183.157\frac{17}{19}$
67. $\$289.718\frac{3}{4}$
68. $\$0.528\frac{6}{23}$
69. 114.77m.
70. $\$22.645\frac{1985}{2182}$
71. 90.45 miles.
72. $\$3.50$
73. $233\frac{14}{27}$ miles.
74. $\$0.715\frac{5}{9}$
75. Performed.
76. $\$2857.142\frac{6}{7}$
77. $\$630$
78. $715\frac{5}{9}$ rods.
79. $\$190.515\frac{45}{77}$
80. $\$691.33\frac{2}{31}$
81. $49\frac{119}{130}$ days.
82. 1 hour $55\frac{89}{293}$m.
83. $6\frac{893}{5184}$ hours.
84. $37\frac{1}{2}$ days.
85. $132\frac{37}{60}$ days.
86. Performed.
87. $26\frac{11}{46}$ days.
88. $323\frac{7}{19}$ days.
89. $5\frac{2}{5}$ yards.
90. $146\frac{2}{3}$ yards.
91. $31\frac{1}{2}$ days.
92. 372 days.
93. $22\frac{22}{119}$ days.
94. $5989\frac{19}{29}$ times.
95. $38\frac{1}{13}$ days.
96. $9\frac{87}{148}$ days.
97. $20\frac{535}{2352}$ days.
98. Performed.
99. $\$99$.
100. 12 pounds.
101. 2520 examples.
102. $\$1.105$
103. $\$17.67$
104. $511\frac{1}{2}$ miles.
105. $12\frac{12}{13}$ days.
106. 15 cows.
107. $9\frac{3}{5}$ men.
108. $35\frac{805}{957}$ men

48. $36\frac{16}{19}$ per cent.
49. 6 per cent., or .06
50. $3\frac{49}{57}$ per cent.
51. $4\frac{126}{181}$ per cent.
52. $\frac{800}{1427}$ of 1 per cent.
53. $\frac{70}{101}$ of 1 per cent.
54. $2\frac{278}{4811}$ per cent.
55. $5\frac{43}{75}$ per cent.
56. Performed.
57. £3 16s. 8d.+
58. 5s. 9d. 3qr.+
59. £3 12s. 11d. 2qr.+
60. 4s. 11d.+
61. £155 0s. 9d. 2qr.+
62. 9s. 5d. 1qr.
63. £9 13s. 3d. 2qr.+
£9 13s. 3d. 2qr.+
64. £12 10s.
65. £7 7s. $7\frac{1}{5}$d.
66. £22 9s. 1d. $3\frac{1}{5}$qr.
67. $131.62
68. $13.851+
69. $6738.03
70. $227.73 commission.
$8881.47 to pay over.
71. $1050
72. $755.625
73. $3888
74. $9652.50
75. $1775.25
76. $4050
77. $5818.50
78. $2194.031+
79. $1668.42
80. $485.40
81. $12.975
82. $36.625
83. $12.988+
84. $540
85. $113.75
86. $42.49

XV.

INTEREST.

1. For 1 month, .005
6 months, .03
7 months, .035
8 months, .04
9 months, .045

2. For 1 year and 1 month, .065
1 year and 3 months, .075
1 year and 4 months, .08
1 year and 10 months, .11

3. For 1 day, .00016+
2 days, .00033+
3 days, .0005
4 days, .00066+
5 days, .00083+
6 days, .001
7 days, .00116+
9 days, .0015
24 days, .004
26 days, .00433+

4. For 2 months and 12 days, .012
3 months and 10 days, .01666+
5 months and 18 days, .028
10 months and 29 days, .05483+

5. Performed.

6. $26.805+

7. $17.13

8. $22.44

9. $63.905+

10. $834.596+

11. $1307.082+

12. $11.90

13. $41.193+

14. $20.747+

15. $2.177+

16. $18.783+

17. $736.213+

18. $211.433+

19. $34.066+

20. $13.646+

21. $158.518+

22. $228.07+

23. $20.738+

24. $23.196+

25. $46.594+

26. $11.107+

27. $111.993+

28. $28.023+

29. $69.932+

30. $5.585+

31. $85.848+

32. $88.068+

33. $12.845+

34. $15.953+

35. $4.677+

36 $13.744+

37.	$28.011+	66.	$0.833+
38.	$49.900+	67.	Performed.
39.	$1908.954+	68.	Performed.
40.	$12.711+	69.	$46.483+
41.	$52.508+	70.	$708.66
42.	$84.63	71.	$17.57
43.	$45.642+	72.	$310.08
44.	$44.645+	73.	$45.871
45.	$53.291+	74.	$22.241+
46.	$68.75	75.	$1135.163
47.	$0.637+	76.	$495.
48.	$6.96	77.	$1529.15
49.	$6.39	78.	$281.627+
50.	$64.982+	79.	$1141.273+
51.	$4369.770+	80.	$55.934+
52.	$0.286+	81.	$21.754+
53.	$108.45	82.	$30.206+
54.	$1.36	83	$111.775+
55.	$4.833+	84.	$5219.49+
56.	$99.175+	85.	$91.60
57.	$0.75	86.	$15.942
58.	$0.285	87.	$225.50+
59.	$217.578+	88.	$165.55
60.	$0.485+	89.	$112.43+
61.	$5.555	90.	$93.20+
62.	$37.68+	91.	$44.616+
63.	$0.872+	92.	$58.417+
64.	$12.327	93.	$1162.273+
65.	$5257.45	94.	$226.608+

95. $14.895+
96. Performed.
97. £3 9s. 9¼d.+
98. £9 16s. 10½d.
99. £152 2s. 10¾d.+
100. £538 4s. 2½d.+
101. £7 5s. 6½d.+
102. £7 0s. 0½d.+
103. £31 7s. 7¾d.+
104. £229 13s. 7¾d.+
105. £54 16s. 4¾d.+
106. £121 1s. 6½d.+
107. £87 7s. 9½d.
108. £35 0s. 7½d.+
109. £15 0s. 5d.+
110. Performed.
111. $160.675+
112. $15.615+
113. $131.735+
114. $10.867+
115. $41.23
116. Performed.
117. $50.80+
118. $143.794+
119. $36.558+
120. $11.740+
121. $252.25
122. $214.793
123. $375.12
124. $145.479+
125. $79.167+
126. Performed.
127. $309.704
128. $155.398+
129. $574.326+
130. £129 3s. 6d. 2qr.+
131. $337.652+
132. $656.065+
133. $6\frac{259}{431}$ per cent.
134. 6 per cent.
135. 6 per cent.
136. 6 per cent.
137. $.\dot{6}$, or $\frac{2}{3}$ of a year.
138. 5 years.
139. $1.\dot{3}$, or $1\frac{1}{3}$ year.
140. $.\dot{6}$, or $\frac{2}{3}$ of a year.
141. $1.\dot{6}$, or $1\frac{2}{3}$ year.
142. $16.\dot{6}$, or $16\frac{2}{3}$ years.

XVI.

DISCOUNT.

1.	$436.893+	7.	$6397.931+
2.	$497.674+	8.	$6.473+
3.	$1403.669+	9.	$105.523+
4.	$1420.565+	10.	$7.179+
5.	$2465.866+	11.	$6.186+
6.	$11.681+	12.	$735.763+

XVII.

BANKING.

1.	$4.262	5.	$2963.52
2.	$13.95	6.	$450.531
3.	$2501.735	7.	$4.356
4.	$435.954	8.	$163.054

XVIII.

EQUATION OF PAYMENTS.

1.	6 months.	7.	7 months.+
2.	7 months 3 days.	8.	6 months.
3.	7 months 28 days.	9.	108 days.+
4.	8 months.	10.	10 months.
5.	8 months.	11.	10 months.
6.	4 months 10 days.		

XIX.

PROFIT AMD LOSS.

1. Profit $35; $31\frac{1}{4}$ per cent.
2. $6.30 per yard.
3. Lost 15 per cent.
4. $5.625 per barrel.
5. $11\frac{695}{1000}+$ per cent.
6. 90 cents per bushel.
7. $3.773+ per cwt
8. You lose 1 per cent
9. You lose $12\frac{1}{2}$ per cent
10. $3\frac{1}{2}$ cents per lb.
11. 18 cents per lb.
12. 30 bushels at $1.25 per bushel.

XX.

PARTNERSHIP.

1. Performed.
2. Wheeler's share $625
   Slade's " $500
   Libbey's " $375
3. Haven's share $800
   Varnum's " $500
   Penniman's " $300
   Conant's " $150
4. A lost $160
   B, $100
   C, $60
   D, $30
5. Elder son, $300
   Younger son, $250
   Daughter, $200
6. A had $2280
   B, $1584
   and C, $2536
7. A's gain, $162
   B's stock, $750
8. Farmer lost $6187.60
   Turner, $4640.70
   Hancock, $1546.90

9. A's share was $154.20
B's, $119.10
C's, $70.10

10. A's gain was $180
B's $90
and C's $50

11 X's loss was $450
Y's, $247
and Z's, $121.50

12. R must have $401.70
S, $370.50

13. A's share was $228
B's, $108
and C's, $100

14. Gould's $352.50
Davis's $330.

15. A paid $11.25
B, $20
C, $29.25

16. A and B pay $6.40, each
C, $5.20
and D, $2

17. Howard's share, $1167.924+
Bender's, $905 141+
Dorr's, $817.547+
Tremere's, $717.786+

XXI.

BANKRUPTCY.

1. A received $96.544
B, $120.60
C, $248.256
D, $166.60

2. A will receive $1052.198+
B, $909.633+
C, $1399.893+

3. A lost $404.25
B, $567.60
C, $640.62
D, $900

4 Bankrupt pays 55½ per cent.
A receives $451.625+
B, $2038.77+
C, $1021.422
D, $65.379
E, $452.103

XXII.

ASSESSMENT OF TAXES.

1 Performed
2 A paid $36.80
B, $19.60
C, $17.07
D, $68.42
E, $8.75
Single woman $9.30
3. $131.565
4. $374.87

XXIII.

GENERAL AVERAGE.

1. Performed.
2. The general average was .013286 per cent. of the whole contributory interest. The vessel paid $47.83; the freight, $1.02; Cargo, viz. E. Foster, $7.97; Greason and Haughton, $3.19; Gold and Tucker $2.79; Bucknam and Gunnison, $5.31; Samuel Wheeler, $2.13; Buck and Hammond, $2.94.
3. The general average or loss per cent. is.0217014+, the ship contributes $238.715+; the freight, $12.478+; Bridge and More, $393.555+; How and Mears, $368.924+; Gray and Bellows, $318.577+; Russell, $79.644+; Howard, $20.074+.

XXIV.

CUSTOM-HOUSE BUSINESS.

1.	Performed.	10.	$2520.76
2.	24cwt. 1qr. 4lb.	11.	$23.96
3.	4cwt. 0qr. 8lb.	12.	$136.05
4.	12cwt. 1qr. 20lb.	13.	$113.225
5.	5cwt. 3qr. 12lb.	14.	$4440
6.	8cwt. 3qr. 8lb.	15.	$37.05
7	6cwt. 2qr. 14lb.	16.	$57.60
8.	39cwt. 3qr.	17.	$27.50
9.	$483.60	18.	$13.767+

XXV.

RATIO.

1.	Performed.	12.	$6.48
2.	$21	13.	50 yards.
3.	496 yards.	14.	56 pounds.
4.	$401.50	15.	$20
5.	28 workmen.	16.	$1794.375
6.	21 bushels.	17.	$1712.746+
7.	$2.25	18.	$0.75
8.	113$\frac{1}{7}$ feet.	19.	6$\frac{168}{197}$ ounces.
9.	72 yards.	20.	$22.222+
10.	8 days.	21.	20$\frac{2}{3}$ gallons.
11.	$78.75	22.	5 months and 25 days

23. $907\frac{1}{5}$lb.
24. $1266.666+
25. $27
26. $40\frac{6}{9}\frac{1}{5}\frac{5}{2}$ days.
27. 4531yd. 1qr. $2\frac{6}{7}$na.
28. 150 men.
29. $954.062+
30. $1787.073+
31. $22\frac{2}{3}$ hours.
32. 13 yards.
33. 217 feet 9 inches.
34. A must pay $20.109+, B, $29.39+
35. 40 yards in breadth.
36. $102\frac{5}{7}\frac{4}{3}$ barrels.
37. $326.70
38. $5845.873+
39. 9 miles 7 furlongs 24.8+ rods.
40. 221 gallons 3.05 quarts.
41. Performed.
42. $102\frac{1}{4}\frac{6}{5}$ days.
43. $9\frac{6}{6}\frac{3}{5}$ days.
44. 170 yards.
45. 450 men.
46. 44 days.
47. 900 tiles.
48. 30lb
49. 96lb.
50. 80 days.
51. 11 men.
52. 24 ounces.
53. 4 more men.
54. $480\frac{6}{2}\frac{0}{2}\frac{0}{5}\frac{3}{0}\frac{5}{1}\frac{}{8}$ miles.
55. 384 barrels.
56. $337\frac{1}{2}$ pears.
57. $288\frac{5}{2}\frac{9}{0}\frac{}{7}$ days.
58. $80.55
59. $1.60
60. 27 acres.
61. 15 pounds.
62. 2 men.
63. 10 men.
64. 6 compositors.
65. $233.333+

XXVI.

CONJOINED PROPORTION.

1.	68 pounds.	5.	$104\frac{8}{15}$ braces
2.	$13\frac{47}{96}$ pounds.	6.	$2223\frac{1173}{1349}$ rubles
3.	210 florins.	7.	$816\frac{152}{153}$ dollars.
4.	8 days' work of D.		

XXVII.

DUODECIMALS.

1.	66 feet 4′ 6″	9.	233 feet 4′ 5″ 9′ 6‴ 4⁗ 6⁗′
2.	10 feet 2′ 10″	10.	1310 feet 9
3.	1176 feet 1′ 6″	11.	$73\frac{2}{27}$ yards.
4.	44 feet 0′ 10″	12.	1615 solid feet.
5.	1102 feet 10′ 6″	13.	$343\frac{37}{108}$ yards.
6.	79 feet 11′ 0″ 6‴ 6⁗′	14.	$76\frac{26}{27}$ yards.
7.	126 feet 3′ 6″ 9‴ 5⁗′ 5⁗′	15.	43 yards.
8.	745 feet 6′ 10″ 2‴ 4⁗′	16.	$\$3.57\frac{8}{81}$

XXVIII.

INVOLUTION.

1.	1728	4.	729
2.	14641	5.	.0729
3.	371293	6.	.2401

7.	.00000256	17.	551.368
8.	.001	18.	83521
9.	$\frac{9}{36}$	19.	49
10.	$\frac{8}{27}$	20.	512
11.	$\frac{64}{59319}$	21.	125
12.	$\frac{81}{625}$	22.	1296
13.	$915\frac{1}{16}$	23.	729
14.	$111\frac{145}{256}$	24.	256
15.	1.61051	25.	19
16	$166496\frac{401}{625}$		

XXIX

EXTRACTION OF THE SQUARE ROOT.

1.	Performed.	15.	9103
2.	Performed.	16.	60704
3.	52	17.	6700
4.	19	18.	407
5.	55	19.	300806
6.	11	20.	5147293
7.	17	21.	512.25
8.	20	22.	917.5
9.	69	23.	6.248
10.	921	24.	14.619
11.	1832	25.	.8164
12.	908	26.	$365\frac{1}{4}$
13.	7006	27.	$37\frac{7}{8}$
14.	830	28.	$17\frac{5}{6}$

29.	$7\frac{1}{7}$	58.	1.75
30	$1\frac{2}{3}$	59.	42
31.	$23\frac{3}{5}$	60.	1
32.	$33\frac{1}{9}$	61.	7
33	2030	62.	1834
34.	2.236+	63.	.5
35	2.828+	64.	9
36	9.165+	65.	.12
37.	9.949+	66.	.21
38.	10.049+	67.	.06
39.	10.954+	68.	8.485+
40.	11.135+	69.	18.708+
41.	11.958+	70.	36.6606+
42.	1.224+	71.	50.299+
43.	.01809+	72.	20.124+
44.	1.516+	73.	38.249+
45.	.774+	74.	18 men.
46.	.866+	75.	56 men.
47.	.816+	76.	27 rows; 27 trees in a row.
48.	.897+		
49.	10.648+	77.	25 men.
50.	16.363+	78.	80 rods.
51.	32	79.	80 rods long, 40 rods wide.
52.	28		
53.	5	80.	120 rods long, 40 rods wide.
54.	7		
55.	55	81.	75 feet
56.	42.5	82.	32 feet
57	53	83.	80 miles.

84. 416 feet.
85. 56 feet 7.788 inches.
86. 20 feet.
87. 178 rods 14 feet 7.23+ inches.
88 28 rods 4 feet 8.232+ inches.
89. 33 inches.
90. 21 feet.
91. 3 miles.
92. $3\frac{3}{8}$ miles.
93. $112\frac{1}{2}$ rods.
94. 31 feet 10.849+ inches.
95. 17 rods 11 feet 11.352+ inches.
96. 1 mile 35 rods 13 feet 1.221504+ inch.
97. 24 rods 13 feet 5.23932+ inches long.
6 rods 3 feet 4.30983+ inches wide.
98. 7 miles 21 rods 15 feet 7.448184+ inches.

XXX.

EXTRACTION OF THE CUBE ROOT.

1. 85
2 576
3. 26.4
4. .6328
5 1203
6 3291.3656+
7 3009
8. 9700
9. 4072
10 90007
11. 8.635
12. .0053
13 4.9731+
14. 8.0259+
15. 9.6548+
16. .6436+
17. .9614+
18. $\frac{2}{5}$
19. $\frac{23}{125}$
20. 2.9624+

21.	30 and 150	29.	16 feet.
22.	336 and 2016	30.	2 feet 4 inches.
23.	28 feet.	31.	4ft. 8.7517+in.
24.	2 feet 1 inch.	32.	9ft. 0.207+in.
25.	12ft. 7.5924+ inches.	33.	4ft. 4.5998+in.
		34.	5ft. 6.2716+in.
26.	3 inches.	35.	6ft. 11.4969+in.
27.	8 inches.	36.	2ft. 7.4762+in.
28.	5 feet.	37.	5ft. 1.4678+in.

XXXI.

ROOTS OF ALL POWERS.

1.	89	3.	111
2.	294	4.	423

XXXII.

EQUIDIFFERENT SERIES.

1.	99	7.	Daily increase 4 miles; distance 189 miles.
2	78 strokes.	8.	19
3	5 miles 236 rods 2 yards.	9.	12 days; 348 miles.
4.	1761 miles.	10.	11days.
5.	3 years.	11.	9
6.	2	12.	30

13. $11\frac{1}{2}$
14. 7 and 10
15. $10\frac{2}{3}$ and $16\frac{1}{3}$
16. $20\frac{1}{3}$ and $36\frac{2}{3}$
17. 8, 12, 16, 20, and 24
18. 13, 20, 27, 34, 41, and 48
19. 61, 88, and 115
20. 78

XXXIII.

CONTINUAL PROPORTIONALS.

1. 768
2. 2
3. 34.171875
4. 3
5. 1
6. Performed.
7. 16383
8. 15624
9. 3577
10. 103.90625
11. 166.66
12. 131070
13. $27962025\frac{5}{8}$
14. $1\frac{88573}{177147}$
15. $4294967.295
16. $687194767.35
17. 3
18. 9
19. 7
20. 5
21. Performed.
22. 1, 7, 49, and 343
23. 46656, 7776, 1296, 216, 36
24. 53
25. $126.247+
26. $116.349+
27. $386.883+
28. $41.102+
29. $1110.011+
30. $9654.516+
31. $15.174+
32. Interest $2207.135+
Amount $3207.135+
33. $6
34. $39.992+
35. $261.542+
36. $2959.657+
37. $473.787+
38 $311.804+

XXXIV.

ANNUITIES.

1.	$4203.012+	15.	To pay yearly;
2.	$1653.289+		by $44.175
3.	$1221.299	16.	$993.66
4.	$4891.614	17.	$1520.729+
5.	$1956.172+	18.	$703.38
6.	$310.277+	19.	$3312.045
7.	$793.617+	20.	$6171.688+
8.	$3680.04+	21.	Son's $1925.007
9.	$1053.04+		Daughter's $1807.858
10.	$120.242+	22.	$1320.156+
11	$11664.619+	23.	$11712.088+
12.	$3138.724+	24.	$1709.098+
13.	$9667.12+	25.	$2078.706+
14.	$736.363+	26.	$2840.913+

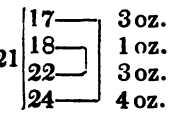
XXXV.

ALLIGATION.

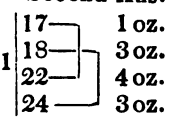
1.	75 cents.	4.	65 degrees.
2.	$0.567+	5.	42 cents.
3.	21 carats fine.	6.	20 carats fine.

The teacher will observe that the following, are answers to questions in *Alligation Alternate;* and, therefore, the scholar may give other answers than those here stated, which may still be correct.

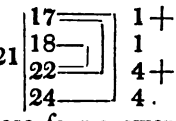
7. First Ans.



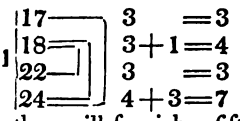
Second Ans.



Third Ans.



Fourth Ans.



These four answers added together will furnish a fifth answer, as follows.

3+1+4+3=11oz. of 17 carats fine.
1+3+1+4= 9oz. of 18 carats fine.
3+4+7+3=17oz. of 22 carats fine.
4+3+4+7=18oz. of pure gold.

A sixth answer might be obtained by adding together the first and second answers; a seventh, by adding together the first, second, and third; an eighth, by adding together the third and fourth; a ninth, by adding together the second, third, and fourth; &c. Any number of answers may be obtained, by multiplying or dividing each quantity in any one answer.

8. 4 ounces each, of 12, 16, and 17 carats fine and 9oz. of 22 carats fine.

9. 30 pounds at 30 cents, 11lb. at 33 cents, 23lb. at 67 cents, and 26lb. at 86 cents. 2nd. answer; 11lb. at 30 cents, 30lb. at 33 cents, 26lb. at 67 cents, and 23lb. at 86 cents.

10. 88 gallons each, of Canary and Sherry, and 48 gallons Claret.

11. 7 ounces of 16, 3oz. of 18, 3oz. of 19, 7oz. of 23 carats fine, and 4oz. of pure gold. 2nd. answer;

7oz. of 16, 4oz. of 18, 3oz. of 19, 5oz. of 23 carats fine, and 6oz. of pure gold. 3rd. answer; 3oz. of 16, 4oz. of 18, 4oz. of 19, 4oz. of 23 carats fine, and 3oz. of pure gold. 4th. answer; 3oz. of 16, 4oz. of 18, 7oz. of 19, 5oz. of 23 carats fine, and 3oz. of pure gold. 5th. answer; 3oz. of 16, 4oz. of 18, 3oz. of 19, 5oz. of 23 carats fine, and 2oz. of pure gold. 6th. answer; 4oz. of 16, 4oz. of 18, 7oz. of 19, 1oz. of 23 carats fine, and 7oz. of pure gold. 7th. answer; 3oz. of 16, 7oz. of 18, 3oz. of 19, 7oz. of 23 carats fine, and 2oz. of pure gold.

12. 15 gallons of water, 2gal. at 56 cents, 4gal. at 62 cents, and 60gal. at 75 cents. 2nd. answer; 2gal. of water, 15gal. at 56, 60gal. at 62 cents and 4gal. at 75 cents. 3rd. answer; 17gal. of water, 2gal. at 56 cents, 64gal. at 62 cents, and 60gal. at 75 cents.

13. 38 bushels of corn, 28bu. of rye, 6bu. of wheat at 90 cents, and 10bu. of wheat at 1 dollar 2nd. answer; 28bu. of corn, 38bu. of rye, 10bu. of wheat at 90 cents, and 6bu. of wheat at 1 dollar. 3rd. answer; 66bu. of corn, 28bu. of rye, 16bu. of wheat at 90 cents, and 10bu. of wheat at 1 dollar.

14. 3 parts of alloy, 1 part of 7 ounces fine, 2 parts of 10 ounces fine, and 9 parts of pure silver. 2nd. answer; 1 part of alloy, 3 parts of 7 ounces fine, 9 parts of 10 ounces fine, and 2 parts of pure silver. 3rd. answer; 3 parts of alloy, 4 parts of 7 ounces fine, 2 parts of 10 ounces fine, and 11 parts of pure silver. 4th. answer; 4 parts of alloy, 1 part of 7 ounces fine, 11

parts of 10 ounces fine, and 9 parts of pure silver.

15. Performed.
16. 5 bushels of corn, 3 bushels of rye, and 2bu. of wheat at 96 cents. 2nd. answer; $4\frac{1}{2}$bu. of corn, $7\frac{1}{2}$bu. of rye, and $4\frac{1}{2}$bu. of wheat at 96 cents.
17. 10 ounces of 16 carats fine, 10oz. of 20 carats fine, 170oz. of pure gold, and 10oz. of alloy.
18. 4.5 ounces of alloy, 1.8oz. of 6.5 ounces fine, and 5.4oz. of 10.5 ounces fine. 2nd. answer; 5.7oz. of alloy, 14.25oz. of 6.5 ounces fine and 54.15oz. of 10.5 ounces fine.
19. Performed.
20. 1.8 ounces of 14 carats fine, and 1.8oz. of 16 carats fine.
21. 27 oz. of 6 ounces fine, 9oz. of 7 ounces fine, and 9oz. of 9 ounces fine. 2nd. answer; 18oz. of 6 ounces fine, 54oz. of 7 ounces fine, and 36oz. of 9 ounces fine.
22. 14 yards at 16 cents, and 14yd. at 17 cents.
23. Performed.
24. 56 pounds each, at 9 and 12 cents, and 98lb. at 18 cents.
25. 2 bushels each, at 31, 37, and 46 cents, and 3bu. at 74 cents.

XXXVI.

PERMUTATIONS.

1.	720	9.	831600
2.	5040	10.	840
3.	120 days.	11.	12600
4.	40320	12.	69300
5.	362880	13.	120
6.	2432902008176640000	14.	72
7.	99041 years 335 days.	15.	3024
8.	Performed.	16.	30240

XXXVII.

COMBINATIONS.

1	20	7.	16800 choices.
2.	66 yoke.	8.	1296 changes.
3.	153 span.	9.	51975 selections.
4.	$27041.56	10.	1000000000000 variations.
5.	£18031572350 9s. 2d.	11.	8648640 variations.
6.	6561 ways.		

XXXVIII.

EXCHANGE

1	$3487.75	20.	$2512.752
2.	£784 14s. 10½d. sterling.	21.	6895 flor. 7 sti. 8 pen.
3.	$8561.28	22.	9044 florins.
4.	£1003 5s. 6d. sterling.	23.	$3063.69
		24.	$4160.68
5.	£804 1s. 0¾d. sterling.	25.	$1195.949
		26.	1019 milrees 728 rees.
6.	$19541.41		
7.	$23938.95	27.	$1573.292+
8.	$8477.82	28.	$2271.195
9.	$1364.60	29.	2109.74\frac{36}{272}$
10.	21697 franks 14 centimes.	30.	2678 dollars 6 reals 20 mravedis.
11.	9907 franks 21 centimes.	31.	$823.64
		32.	$5809.92
12.	$3871.50	33.	$561.60
13.	$2419	34.	$4034.61
14.	$378.95	35.	1318 rix dols. 24 skil.
15.	3737 marks 4 schil.		
16.	$2106.215	36.	$2481.75
17.	$2886.275	37.	819 rix dols. 42 skil.
18.	2296 marks 10 schil. 8 pfen.	38.	$1209.57+
		39	$1160.68+
19.	$4964.67		

40. $1045.66
41. 10456 rubles 60 cop.
42. $1516.62
43. 10495 rubles 20 cop.
44. $2775.27
45. $2747.415
46. 4919 rix dols. 6 good gro.
47. 957.15\frac{1}{12}$
48. 3286 rix dols. $2\frac{2}{13}$ good gro.
49. $1607.375
50. 4164 rigsbank dollars 4 marks $3\frac{1}{5}$ skillings.
51. $945.10
52. 6076 rigsbank dollars 3 marks 14 skillings.
53. $3218.24
54. 2353 ducats 5 carlins.
55. $2876.97
56. 2391 ducats 5 carlins.
57. $2915.24
58. 607 oncie 10 tari. 5 grani.
59. $2890.38
60. 1035 crowns 2 tari. 8 grani.
61. $1975.045
62. 1800 pezze 10 soldi.
63. $3063.11
64. 1334 pezze 16 soldi $3\frac{15}{51}$ denari.
65. $840.77
66. 10215 lire 6 soldi 8 denari.
67. $1450.98
68. 12903 lire 4 soldi $6\frac{6}{31}$ denari.
69. $1317.813
70. 10181 lire 17 soldi 6 denari.
71. $1255.114
72. 10099 lire Italiane
73. $971.75
74. $1366.20
75. 3484 florins.
76. $1479.78
77. 2483 rix dols. 36 creut.
78. 1834 crowns 50 baj.
79. $2050
80. $443.50
81. 2301 scudi.
82. $1625.445
83. 1686 scu. 6 tarins.
84. $1063.75

85. 4344$\frac{1}{7}$ piastres.
86. $1575.53
87. 5504 piastres.
88. $8370.60
89. 13826 sicca rupees 8 annas.
90. 21239.83\frac{1}{4}$
91. 65810 rupees 12 annas.
92. $53000
93. $5068.75
94. 12938 rupees 2qr.
95. $4122.37
96. $3320.625
97. 6102 rupees.
98. $2415.15
99. $17973.86
100. 5996 tales 5 mace.
101. $24190.15
102. $2786.16
103. 928 tales 7 mace 2 candarines.
104. $1876.06
105. 2142.66\frac{1}{4}$
106. 2203 dols. 1 soocoo.
107. $5960.76
108. 878 tales 3 pardows 2 mace.
109. 4736.76\frac{2}{3}$
110. 36175 flor. 2 schil.
111. $17777.97
112. 6405.23\frac{1}{16}$
113. 5274 dols. 4 reals 13.6 mar.
114. $2931.50
115. 3754 rix dols. 6 fanams.
116. $4132.75
117. 7701 dols. 5 livres.
118. Performed.
119. 35s. 7$\frac{1}{2}$ grotes per £ sterling.
120. 36s. 0$\frac{1}{4}$ grotes per £ sterling.
121. 35s. 3$\frac{1}{2}$ grotes per £ sterling.
122. 33s. 2 grotes per £ sterling.
123. $4.44 per £ sterling.
124. $4.465 per £ sterling.
125. 100 pence Flemish or 2$\frac{1}{2}$ florins per dollar.
126. 4 franks 48$\frac{392}{676}$ centimes per dollar.
127. Performed.

128. Performed.
129. Price $68\frac{14}{17}$d. sterling per milree. Gain $4\frac{14}{17}$d. per milree.
130. $26\frac{14}{27}$d. sterling.
131. $32\frac{1}{3}$ cents per mark banco.
132. $54\frac{1}{4}$ pence sterling

XXXIX.

MENSURATION.

1. 187.5 square feet.
2. 173.4375 feet.
3. 142.5 rods.
4. 26.48 acres.
5. $101\frac{11}{32}$ inches.
6. 12 feet.
7. $15\frac{3}{4}$ feet.
8. 254.469+ inches.
9. 103.132+ inches.
10. 62.388+ inches.
11. 199262116.292+m.
12. 27 inches.
13. 1ft. $1714\frac{1}{2}$in.
14. $53\frac{1}{12}$ feet.
15. 9.696 inches.
16. 5ft. 756in.
17. 16.297456 feet.
18. 1ft. 156.95559in.
19. 972 inches.
20. 998.4 inches.
21. 716.2831242 inches.
22. $1526\frac{2}{3}$ inches.
23. 25.510416 feet.
24. 3656.8224 inches.
25. 496.454488 gal.
26. 263.8561+ inches.
27. 262167248.9+m.
28. 235.61944875in.
29. 33.44404 gallons.
30. 125.0477+ gallons
31. 165.93958+ gallons.
32. $101\frac{1}{19}$ tons.
33. $191\frac{16}{19}$ tons.
34. $109\frac{17}{19}$ tons.
35. 454.0853 tons.
36. 219.362602 tons.
37. $102\frac{6}{19}$ tons.

XL.

MECHANICAL POWERS.

1. 1440 pounds.
2. 160 pounds.
3. 9 feet.
4. 1 foot.
5. $56\frac{9}{11}$ pounds.
6. $333\frac{1}{3}$ pounds.
7. 4 feet, and 8 feet.
8. A carries $93\frac{3}{4}$ pounds; B carries $156\frac{1}{4}$ pounds.
9. 5 feet.
10. 6.4 inches.
11. $3\frac{1}{9}$ pounds.
12. 420 pounds.
13. $5485\frac{5}{7}$ pounds.
14. 270 pounds.
15. 200 pounds.
16. $166\frac{2}{3}$ pounds.
17. 1140 pounds.
18. $57\frac{1}{7}$ pounds.
19. $506\frac{2}{3}$ pounds.
20. $71\frac{3}{7}$ feet.
21. $2348\frac{16}{33}$ pounds.
22. $857\frac{1}{7}$ pounds.
23. 300 pounds.
24. $214\frac{2}{7}$lb. $428\frac{4}{7}$lb.
25. 21991.14855lb.
26. 5026.54824lb.
27. 9ft. 3.8+in.
28. 164933.61412+lb.

XLI.

MISCELLANEOUS QUESTIONS.

1. $\frac{1}{20}$
2. .05
3. $15\frac{3}{4}$
4. $\frac{29}{40}$
5. $\frac{13}{30}$
6. $\frac{3}{8}$
7. 20
8. 55
9. \$70.80
10. \$500

11. 10 days.
12. Income $200. A spends $175. B $205. a year.
13. 25lb. at $1.10 to 10lb. at 75 cents.
14. $17\frac{1}{2}$ days.
15. 323 miles.
16. $2 per gallon.
17. $\frac{1}{15}$ of his annual income for 4 years is $\frac{4}{15}$ of it for 1 year; consequently $\frac{4}{15}$ of 1 year's income is 20 dollars more than $\frac{1}{4}$ of it. $\frac{1}{4}$ is equal to $\frac{15}{60}$, and $\frac{4}{15}$ is equal to $\frac{16}{60}$; therefore $\frac{15}{60}$ of his income and 20 dollars is equal to $\frac{16}{60}$ of it, and 20 dollars must be $\frac{1}{60}$ of it. The answer is 60 times $20. or $1200.
18. The hare, running at the rate of 10 miles an hour, runs $195\frac{5}{9}$ yards in 40 seconds, which, added to 40 yards, makes $235\frac{5}{9}$ yards, which the hare has before the hound, when the hound starts. The hound gains 14080 yards in an hour, which is $234\frac{6}{9}$ yards in a minute; therefore the hound must run as many minutes as $234\frac{6}{9}$ is contained times in $235\frac{5}{9}$. The answer is $1\frac{1}{264}$ minute. The distance run by the hound is 530 yards.
19. Deducting $2\frac{1}{2}$ geese from 100, the remainder is $97\frac{1}{2}$ geese, which is $\frac{2}{6}$ of his whole flock; because the whole is $\frac{6}{6}$, and half as many more is $\frac{3}{6}$. If $97\frac{1}{2}$ is $\frac{2}{6}$ of his flock, $\frac{1}{6}$ of $97\frac{1}{2}$ is $\frac{1}{6}$ of it; $\frac{1}{9}$ of $97\frac{1}{2}$ is $10\frac{5}{18}$, and 6 times $10\frac{5}{18}$ is 65. Ans. 65 geese.
20. 48 men.
21. 15 boys; 45 women; 90 men.
22. The sheep is to the cow as 1 to 8; the cow to the oxen as 8 to 24; $1+8+24=33$; there-

fore $\frac{1}{33}$ of $82.50 is the price of the sheep. Ans. sheep $2.50; cow $20; oxen $60.

23. If 9 inches be added to $\frac{1}{2}$ the body, it makes the length of the tail; if to this, 9 inches more be added, it makes the body, that is, $\frac{1}{2}$ the body and 18 inches make the whole body. The body, then, is 36 inches, and the whole fish is 6 feet.
24. 390270
25. $40\frac{1}{4}$ cents.
26. $68.492+
27. 6 cents.
28. In moving once round the dial plate, the the minute hand gains 55 minutes on the hour hand; therefore it moves $\frac{60}{55}$ or $1\frac{1}{11}$ minute, to gain 1 minute. While the minute hand in moving round from 12 to 12 again, the hour hand will have moved 5 minutes, and the minute hand will have to gain 60 minutes, before they will again be together. 60 times $1\frac{1}{11}$ minute is $65\frac{5}{11}$ minutes = 1h. 5m. $27\frac{3}{11}$ seconds. Ans. 5 minutes $27\frac{3}{11}$ sec. past 1.
29. The boat moving up stream being retarded 2 miles an hour by the current, goes only 6 miles an hour; the other being aided 2 miles an hour by the current, goes 10 miles an hour; 300 must be divided into two parts in the ratio of 6 to 10. $6+10=16$; $\frac{1}{16}$ of 300 is $18\frac{3}{4}$; $18\frac{3}{4} \times 6 = 112\frac{1}{2}$ $18\frac{3}{4} \times 10 = 187\frac{1}{2}$; Ans. $112\frac{1}{2}$ miles from lower, $187\frac{1}{2}$ from upper place.
30. $50 apiece; 200 melons.
31. 80
32. 24 of each.
33. 24 ft. 0′. 3″. 4‴. 6⁗

34. 5 per cent.
35. A $7\frac{25}{28}$ and B $6\frac{11}{28}$ miles per hour.
36. $11875
37. Cap. $243; Men $162 each; boy $54.
38. A's 14s. $0\frac{8}{19}$d.; B's 10s. $6\frac{6}{19}$d.; C's 8s. $5\frac{1}{19}$d.; D's 7s. $0\frac{4}{19}$d.
39. 21 minutes $49\frac{1}{11}$ seconds past 4
40. A 312, B 412, and C 476 acres.
41. 1 foot $5\frac{13}{67}$ inches.
42. $10\frac{419}{2912}$
43. A can do $\frac{1}{10}$ of it, and B $\frac{1}{13}$ of it in a day; therefore both together can do $\frac{23}{130}$ of it in a day; and it will be finished in as many days as $\frac{23}{130}$ is contained times in $\frac{130}{130}$. Ans. $5\frac{15}{23}$ days.
44. A's $57142\frac{6}{7}$; B's $42857\frac{1}{7}$
45. 600 trees.
46. The first will empty $\frac{1}{60}$ of it in a minute; the second $\frac{1}{120}$ of it, and the third $\frac{1}{180}$ of it in a minute; these added together make $\frac{11}{360}$ of it; hence they will all empty $\frac{11}{360}$ of it, in a minute. 11 is contained in 360 $32\frac{8}{11}$ times. Ans. $32\frac{8}{11}$ minutes.
47. $311.50
48. When they were married, her age was 1 year to his 3; 15 years being added to their ages, hers is 2 years to his 4; that is, her age was doubled, and his was $\frac{4}{3}$ of what it was. As 15 years doubled her age, she was 15, and he was 45.
49. A $445; B $230; C $325
50. $\frac{53}{63}$
51. 5329 square feet.
52. $2800.
53. The three men ate 8 loaves; that is, $2\frac{2}{3}$ loaves each; B furnished only $\frac{1}{3}$ of a loaf more than

he ate; but A furnished $\frac{7}{3}$ of a loaf more than he ate. The decision was, that A should have 7 pieces, and B 1 piece.

54. 6.

55. $\frac{2}{3}$ and $\frac{3}{4}$, when reduced to a common denominator, are $\frac{8}{12}$ and $\frac{9}{12}$; therefore their ages are in the ratio of 8 to 9, and 10 years must be $\frac{1}{9}$ of the age of the elder, and $\frac{1}{8}$ of the age of the younger. Elder 90, younger 80 years.

56. He bought 4 at 2 cents apiece, as often as he bought 3 at 3 cents apiece. 4 at 2 cents is 8 cents, and 3 at 3 cents is 9 cents; therefore he gave 17 cents for every 7 lemons, which is $2\frac{3}{7}$ cents each. He sold them at $2\frac{1}{2}$ cents each. The difference between $2\frac{1}{2}$ and $2\frac{3}{8}$ is $\frac{1}{14}$. Hence it appears, he gained $\frac{1}{14}$ of a cent on each lemon, which is 1 cent on 14 lemons. Therefore he bought $14 \times 25 = 350$ lemons.

57. $8\frac{4}{7}$ barrels.

58. To answer this question, the 12 hours from noon to midnight are to be divided into 2 parts, in the ratio of 4 to 5. $4+5=9$; $\frac{1}{9}$ of 12 is $1\frac{1}{3}$; $1\frac{1}{3} \times 4$ is $5\frac{1}{3}$. Ans. 20 minutes past 5.

59. $137\frac{30}{61}$

60. The difference between the squares is 309 men; consequently, a side of the last square was 155 men. The square of 155 is 24025, which was 25 men more than his number. Ans. 24000 men.

61 The first will fill $\frac{1}{40}$ of it in a minute, and the second $\frac{1}{50}$ of it in a minute; $\frac{1}{40}$ and $\frac{1}{50}$, brought to a common denominator, are $\frac{4}{200}$ and $\frac{5}{200}$. They both fill $\frac{9}{200}$ of it in a minute; the discharging pipe empties $\frac{1}{25}$, which is $\frac{8}{200}$ of it in

a minute; therefore the supplying pipes gain $\frac{1}{200}$ of it in a minute, and the cistern will be filled in 200 minutes. Ans. 3 hours 20 min.

62. The first and second do $\frac{7}{9}$ of it, and the third the other $\frac{2}{9}$ of it; the second and third do $\frac{7}{11}$ of it; therefore the first does $\frac{4}{11}$ of it, and the first and third together $\frac{4}{11}$ and $\frac{2}{9}$ of it; $\frac{4}{11}$ and $\frac{2}{9}$ added together, is $\frac{58}{99}$; consequently the second does the other $\frac{41}{99}$. Ans. $\frac{41}{99}$.

63. There were 3 cows and 6 sheep to 1 ox; that is, $\frac{1}{10}$ were oxen, $\frac{3}{10}$ cows, and $\frac{6}{10}$ sheep. Ans. 8 oxen, 24 cows, 48 sheep.

64. $560.173

65. $12500 is to be divided into 2 parts, in the ratio of 7 to 9. $7+9=16$; $\frac{1}{16}$ of 12500 is 781.25; $781.25\times7=5468.75$; $781.25\times9=7031.25$. Ans. wife's $7031.25, son's, $5486.75.

66 $\frac{1}{15}$ of it would last both together 1 day; $\frac{1}{27}$ of it would last the woman alone 1 day; consequently the difference between $\frac{1}{15}$ and $\frac{1}{27}$, which is $\frac{4}{135}$, would last the man alone 1 day; therefore it would last the man alone as many days as $\frac{4}{135}$ is contained times in $\frac{135}{135}$, which is $33\frac{3}{4}$ times. Ans. $33\frac{3}{4}$ days.

67. 12 calves; 6 sheep.

68. $151.494+

69. The minute hand must gain 30 minutes on the hour hand before they will point in opposite directions. The minute hand, in moving $1\frac{1}{11}$ minute, gains 1 minute; therefore, $1\frac{1}{11}\times30$ must give the Answer $32\frac{8}{11}$ minutes past 12.

70. One man would do it in 3 times 56 days, or 168 days; and one woman would do it in 224 days. One man does $\frac{1}{168}$ of it in 1 day, and one

woman $\frac{1}{224}$; $\frac{1}{168}$ and $\frac{1}{224}$, reduced to a common denominator, are $\frac{4}{672}$ and $\frac{3}{672}$, $=\frac{7}{672}=\frac{1}{96}$. Ans. 96 days.

71. $\frac{5}{8}$ of 12 is $7\frac{1}{2}$. $12+7\frac{1}{2}=19\frac{1}{2}$. $\frac{5}{8}$ of the father's age being added to $19\frac{1}{2}$ years, gives the father's age; therefore $19\frac{1}{2}$ years is $\frac{3}{8}$ of the father's age, and $\frac{1}{8}$ of it is $\frac{1}{3}$ of $19\frac{1}{2}$ years, which is $6\frac{1}{2}$ years; $6\frac{1}{2}\times 8=52$. Ans. 52 years.

72. The first lived $\frac{16}{8}$, the second $\frac{23}{8}$, and the third $\frac{28}{8}$ of a mile from the church; therefore, the first must pay $28 as often as the second pays $23 and the third $16. $28+23+16=67$. The first must pay $\frac{28}{67}$; the second $\frac{23}{67}$, and the third $\frac{16}{67}$ of $730. Ans. First $305.07\frac{31}{67}$; second $250.59\frac{47}{67}$; third $174.32\frac{56}{67}$.

73. Allen can reap $\frac{1}{13}$, and Brooks $\frac{1}{16}$ in a day; $\frac{1}{13}$ and $\frac{1}{16}$ added together make $\frac{29}{208}$; both together will reap it in as many days as 29 is contained times in 208. Ans. $7\frac{5}{29}$ days.

74. In $22\frac{1}{2}$ days A travels 405 miles, and B travels the same distance in $40\frac{1}{2}$ days; because A turned back 9 days' travel for B, which he had to travel over again in pursuing his journey, making 18 days of B's travelling; $18+22\frac{1}{2}=40\frac{1}{2}$; $40\frac{1}{2}$ is contained 10 times in 405. Ans. 10 miles per day.

75. 1 minute 33 seconds.

76. 11 rods 4 yards 2 feet $0\frac{2}{3}$ inches.

77. 12 bushels of corn to 25 of oats.

78. $9\frac{37}{75}$ cents.

79. He had travelled 42 parts of the distance, and had 25 parts to travel. $42+25=67$; $\frac{1}{67}$ of 335 is 5; $5\times 42=210$; 210 miles in 7 days. Ans. 30 miles per day.

80. Wife's $\$18833.33\frac{1}{3}$; son's $\$17333.33\frac{1}{3}$; daughter's $\$13833.33\frac{1}{3}$

81. Each stockholder owns $\frac{4}{32}$ of the whole. A sold $\frac{3}{32}$, and had $\frac{1}{32}$ left. B sells 2 of his shares, which are divided equally among the other shares; consequently there are now only 30 shares; therefore, A owns $\frac{1}{30}$ of the whole.

82. 367 feet 6 inches.

83. By selling $\frac{1}{4}$ of his linen and $\frac{1}{5}$ of his cotton for $\$12$. he gained 60 cents; therefore the same must have cost him $\$11.40$; and 4 times the same quantity must have cost him 4 times as much; hence all his linen and $\frac{4}{5}$ of his cotton cost him $\$45.60$; which leaves $\$4.40$ for the price of $\frac{1}{5}$ of the cotton; $\$4.40 \times 5 = \$22$. the whole cost of the cotton; leaving $\$28$. for the cost of the linen. Ans. 84 yards of linen, 110 yards of cotton.

84. in 8 months.

85. 420 skins.

86. 12 cents per dozen.

87. 15 feet 8.495 + inches.

88. Spouting from his throat only, he will fill $\frac{1}{6}$ of the cistern in an hour; from his right eye only, $\frac{1}{48}$ of it in an hour; from his left eye only, $\frac{1}{72}$ of it in an hour; and from his right foot only, $\frac{1}{4}$ of it in an hour. These, added together, make $\frac{65}{144}$ of it in an hour. $\frac{65}{144}$ is contained in $\frac{144}{144}$ $2\frac{14}{65}$ times. Ans. 2h. 12min. $55\frac{5}{13}$sec.

89. After receiving 5 times as much as he spent, he had, 200 dollars. If he had received as much only as he had spent, he would have had $\$100$; therefore the other $\$100$ is 4 times as much as he spent. Ans. $\$25$.

90. As the hare makes 4 leaps to the hound's 3, the hound makes 6 leaps to the hare's 8, and 2 leaps to the hare's $2\frac{2}{3}$; therefore, since 2 of the hound's leaps are equal to 3 of the hare's, the hound, in making 2 leaps, gains $\frac{1}{3}$ of 1 of the hare's leaps, and by 1 leap, $\frac{1}{2}$ as much, that is, $\frac{1}{6}$ of 1 of the hare's leaps; consequently the hound must make 6 times 50 leaps. Ans. 300 leaps.

91. 5lb. at 10cts. 2lb. at 13cts. and 2lb at 16cts.

92. $32\frac{1}{4}$ gallons.

93. A's loss is $80\frac{140}{467}$ tons; B's $54\frac{282}{467}$ tons; C's $15\frac{45}{467}$ tons.

94. A ought to pay $\$16.44\frac{4}{9}$, and B, $\$20.55\frac{5}{9}$.

95. To perform this question, first find the rent of the house for 14 weeks, and divide it among the 10 first boarders; then find the rent for 3 weeks, and divide it first among 14 boarders, then among 18, &c. to the end of the time. The first 10 boarders will pay a share in each of the 5 classes of boarders; the first 4 admitted in 4 classes, the second 4 in 3 classes, &c.

One of the 1st. class must pay $\$39.090\frac{1117613906}{2573060649}$

2d. " $\$12.167\frac{82301817}{2573060649}$

3d. " $\$\ 3.046\frac{12462065}{28275339}$

4th. " $\$\ 4.841\frac{7553}{24167}$

5th. " $\$\ 2.218\frac{316}{338}$

96. 3 apples and 12 pears cost 20 cents, and 4 times as many will cost 4 times as much; that is, 12 apples and 48 pears will cost 80 cents; the price of 12 apples and 6 pears, taken from 80 cents, leaves 63 cents for 42 pears, which is $1\frac{1}{2}$ cent for one. Ans. the price of an apple is $\frac{2}{3}$ of a cent, that of a pear $1\frac{1}{2}$ cent.

97. 221 stones.
98. 52 rods long. 3 acres.
99. A's $1126.62; B's $3755.19; C's $4506.23; D's $5632.85
100. $1389.42+
101. 14400 shingles.
102. 51.11\frac{1}{9}$
103. The 3 parcels of hops, added together, make 1850lb. which, at 12 cents a pound, come to $222. But Allen's 450lb. being $33\frac{1}{3}$ per cent. better, are equal to 600lb. of the others; 600lb.+ 890lb.+ 510lb.= 2000lb.; $222 for 2000lb. is 11 cents 1 mill per lb. which is the value of Brooks' and Chase's hops; the value of Allen's, being $33\frac{1}{3}$ per cent. better, is 14 cents 8 mills per lb.

Ans. Chase's 510lb., at 11cts. 1 mill, $56.61
Brooks' 890lb., at 11cts. 1 mill, $98.79
Allen's 450lb. at 14 cts. 8 mills, $66.60
$222.00

104. The solution of the preceding question renders any explanation of this unnecessary.

Ans. Y's 60bls. at 8.57\frac{1}{7}$, is 514.28\frac{4}{7}$
X's 60bls. at the same, is 514.28\frac{4}{7}$
W's 60bls., at 12.85\frac{5}{7}$, is 771.42\frac{6}{7}$
$1800.00

105. $5\frac{1}{7}$ months.
106. First term is 2; difference 3.
107. $723.63.
108. The first cup weighs 12oz.; therefore, the second cup and cover together weigh 36oz. and the 2 cups and cover, taken together, weigh 48oz. If the first cup be covered, it

will weigh twice as much as the second ; therefore, the first cup and cover are $\frac{2}{3}$ of 48 oz. ; and the second cup $\frac{1}{3}$ of 48oz. which is 16oz. ; consequently the cover is 20oz. Ans. cover 20oz. ; second cup 16oz.

109. The Bill was drawn for £1759 1s. $9\frac{9}{11}$d. Degrand invested for Grey's account $8348.07+

110. $53\frac{49086571}{181398528}$

111. 115 rods 107 feet 25.046 + inches.

112. $473.70+

113. $\frac{1}{4}$ of the first, and $\frac{1}{3}$ of the second are together equal to $120 ; therefore $\frac{3}{4}$ of the first, and $\frac{3}{3}$, or the whole of the second, are three times as much, that is, $360. Taking $360 from $400, there remains $40 for $\frac{1}{4}$ of the first. Ans. First $160, and the second $240.

114. 6859

115. $948.88\frac{8}{9}$

116. $29.993+

117. 5 cwt. each at $12. and $10.; and 20 cwt. at $8.

118. $1215

119. $46.35

120. Wheat $1.25 ; rye 90 cents.

121. He bought 48 apples ; they cost 20 cts.

122. The ratio of the areas of two squares is the ratio of the squares of their sides. The square of 3 is 9, and the square of 5 is 25 ; therefore 30600 square feet is to be divided into two parts in the ratio of 9 to 25 ; 9+25 =34 ; 30600÷34=900 ; 900×25=22500 ; 900 × 9=8100 ; $\surd$8100 is the side of the smaller piece, and $\surd$ 22500 is the side of the greater piece. Ans. Side of the smaller piece, 90 feet ; side of the greater, 150 feet.

123. $204\frac{4}{17}$ boards.
124. 66 cents.
125. $\$119.4375$
126. $39\frac{1}{11}$ per cent.
127. He lost $\$39.06$
128. $6\frac{1}{2}$ per cent.
129. Bill drawn, $\$2556$; Discount, $\$25.56$
130. 2250lb. at $23\frac{1}{3}$ cent per lb.
131. The waste being 18 per cent. 615lb. clear must have come from 750lb. rough, leaving 10lb. rough in G's hands. 615lb. clear at 60 per 100lb. is $\$3.69$, which will pay for $46\frac{1}{8}$lb rough. Ans. $36\frac{1}{8}$lb.
132. The three lots together make 3402lb. which, at 10 cents a pound, come to $\$340.20$; but 100lb. of Bond's hops are equal in value to $112\frac{1}{2}$lb. of Allen's; 720lb. is $7\frac{1}{5}$ hundred pounds; $112.5\text{lb.} \times 7\frac{1}{5} = 810\text{lb.}$ therefore Bond's 720lb. are equal in value to Allen's 810lb. Cook's hops are 25 per cent. better than Bond's; 25 per cent. on 112.5lb. is $28\frac{1}{8}$lb. which added to $112\frac{1}{2}$lb. makes $140\frac{5}{8}$lb.; therefore Cook's hops are $40\frac{5}{8}$ per cent. better than Allen's. $40\frac{5}{8}$ per cent. on 1872lb. is 760.5lb. which, added to 1872lb. makes 2632.5 lb.; therefore Cook's 1872lb. are equal in value to $2632\frac{1}{2}$lb. of Allen's. $810+810+2632.5=4252\frac{1}{2}$lb. $\$340.20$ for 4252.5lb. is 8 cents per lb. which is the value of Allen's hops. $12\frac{1}{2}$ per cent. on 8 cents is 1 cent; therefore Bond's hops are worth 9 cents per lb. and 25 per cent. on 9 cents is $2\frac{1}{4}$ cents; therefore Cook's hops are worth $11\frac{1}{4}$ cents per lb. Ans. Allen's $\$64.80$, Bond's $\$64.80$, and Cook's $\$210.60$.
133. A $\$8.43\frac{3}{4}$; B $\$8.43\frac{3}{4}$; C $\$6.56\frac{1}{4}$; D $\$1.56\frac{1}{4}$.
134. 1 acre.
135. 4 feet 0.22542 + inch.
136. 46 miles 131 rods 2.921 + feet.

PRIZE QUESTION.

137. In June, 1835, a premium of $ 50 was offered for the most "lucid analytical solution" of the last question in the Third Part of Emerson's North American Arithmetic; and subsequently a committee to examine the solutions presented and award the premium, was raised in the manner proposed. The committee have given a very careful and patient attention to the labors of the trust confided to them, and they now make the following

REPORT.

The whole number of solutions presented, was 112; of which 48 gave the true answer. After excluding those solutions which gave incorrect answers, the committee proceeded to diminish the remaining number, by excluding those which were algebraical, and, also, those which were performed either by *position* or by *proportion*; retaining for the comparative examination, such only as were strictly analytical. The solution for which the committee have awarded the premium, was presented by JAMES ROBINSON, Principal of the Department of Arithmetic Bowdoin School, Boston—It is as follows:

SOLUTION. It is evident that a part of the given number of oxen, in each condition of this question, must be supported by the grass *at first standing* on the given number of acres, and that the remaining part must be supported by the *growth*. It is also evident that the number of oxen that can be supported by the grass at first standing on the ground, must be in a direct ratio to the number of acres, and in an inverse ratio to the time of grazing. And it is further obvious, that the number of oxen that can be supported by the growth of the grass, must be in a direct ratio to the number of acres, without any regard to the *time* of grazing; because, the number of oxen that would consume the growth of any given number of acres during any given time, would consume the same growth continually.

By the first condition of the question, 12 oxen consume $3\frac{1}{2}$ acres of grass and its growth in 4 weeks; the 10 acres being $\frac{20}{7}$ of $3\frac{1}{2}$ acres, it would require $\frac{20}{7}$ as many oxen to consume 10 acres of grass and its growth in the same time;—and 12 oxen multiplied by $\frac{20}{7}$ are $34\frac{2}{7}$ oxen. To consume the same in 9 weeks, would require only $\frac{4}{9}$ as many oxen; and $34\frac{2}{7}$ oxen multiplied by $\frac{4}{9}$ are $15\frac{5}{21}$ oxen.

By the second condition, 21 oxen consume 10 acres of grass and its growth in 9 weeks;—and 21 oxen less $15\frac{5}{21}$ oxen are $5\frac{16}{21}$ oxen. Then it follows, that $5\frac{16}{21}$ oxen in 9 weeks would consume the growth of 10 acres of grass during the 5 remaining weeks. To consume the growth of 10 acres during 9 weeks, would require $\frac{9}{5}$ as many oxen, and $5\frac{16}{21}$ oxen multiplied by $\frac{9}{5}$ are $10\frac{13}{35}$ oxen. Then, 21 oxen less $10\frac{13}{35}$ oxen are $10\frac{22}{35}$ oxen. Hence it is evident that $10\frac{22}{35}$ oxen in 9 weeks would consume the grass at first on the 10 acres; —and it is also evident that $10\frac{13}{35}$ oxen, in 9 weeks, would consume the growth of the 10 acres of grass during the 9 weeks.

The 24 acres in the third condition, being $\frac{24}{10}$, or $2\frac{2}{5}$ times 10 acres, it would require $2\frac{2}{5}$ times $10\frac{22}{35}$ oxen to consume the grass at first on the 24 acres, in 9 weeks;—and $10\frac{22}{35}$ oxen multiplied by $2\frac{2}{5}$ are $25\frac{89}{175}$ oxen. To consume the same in 18 weeks, would require only $\frac{9}{18}$, or $\frac{1}{2}$ as many oxen;—and $25\frac{89}{175}$ oxen divided by 2, are $12\frac{132}{175}$ oxen. And to consume the growth of the 24 acres of grass during the 18 weeks, would require $2\frac{2}{5}$ times $10\frac{13}{35}$ oxen; and $10\frac{13}{35}$ oxen multiplied by $2\frac{2}{5}$ are $24\frac{156}{175}$ oxen.

Lastly, $12\frac{132}{175}$ oxen plus $24\frac{156}{175}$ oxen are $37\frac{113}{175}$ oxen, the number required.

By order of the Committee,
P. MACKINTOSH, *Chairman.*